

Life in the Universe
Astronomy 183 — Spring, 2010

<http://www.physics.nau.edu/~trilling/teaching/spring2010/lecture/>

Physical Sciences (Building 19) Room 233 TTh 2:20 p.m. – 3:35 p.m.

Instructor: Professor David E. Trilling

Course description:

Welcome to *Life in the Universe*. In this class, we will discuss and learn about the origin and evolution of life and the search for life in the Universe. We will discuss topics in physics, chemistry, biology, geology, and astronomy that are related to astrobiology — the study of life in the Universe. This course will help develop essential skills such as critical thinking, quantitative analysis, and scientific inquiry, and is in the liberal studies Science/Applied Science distribution block. I'm looking forward to our adventure together!

Course prerequisites and objectives:

There are no prerequisites for this course. The following are among the goals for this course:

Students will be able to discriminate between scientific and pseudo-scientific claims about evidence for extraterrestrial life (scientific inquiry, critical reading).

Students will be able to identify the principal astrophysical events which contributed to the origin and evolution of life on Earth and use this information to make conclusions about the likelihood of extraterrestrial life (creative thinking, critical thinking, quantitative analysis, and scientific inquiry).

Students will be able to describe the key elements of life's interaction with the planetary environment (environmental consciousness, scientific inquiry, critical thinking quantitative analysis).

Students will be able to make predictions about the likelihood of extraterrestrial intelligent life, based on understanding of key evolutionary events that led to its appearance on earth (scientific inquiry, creative thinking, critical thinking, quantitative reasoning).

Students will be able to identify the technological challenges posed by space travel between the planets and between stellar systems (technology and its impact, quantitative reasoning, critical thinking).

Students will define and criticize ethical issues in the debate about how to respond to contact with hypothetical extraterrestrial species, based partly on knowledge of historical intercultural exchanges among humans (ethical reasoning, creative thinking).

Course structure and approach:

People learn in all kinds of ways. This class will therefore comprise many avenues of learning. We will of course have lectures, which will include demonstrations and in-class group discussions. There will be reading assignments. There will be assignments to read the newspapers and web pages. There will be homework assignments, a modest paper assignment, and occasional quizzes. There will also be one midterm and one final exam (see below for grading scheme).

At the end of this syllabus, I tell you *How to succeed in this class* and *How not to succeed in this class*.

Textbook and required materials:

Life in the Universe by Bennett and Shostak, second edition. I will not be teaching directly from the textbook; instead, this book should be used as another resource from which you can learn the material. Consequently, I am calling this book *recommended* but not required. This book is on reserve at Cline Library. Readings from this book that you may find helpful are listed on the course schedule.

Naturally, there are a lot of other books in the NAU libraries that cover our course material (chemistry, geology, physics, astronomy, biology). You should definitely seek these out. I also have a library of books in my office that might be useful or interesting. Come talk to me if you want to see these — depending where we are in the course, you can either borrow the book, or sit in my office and read it.

You will also need a calculator. Each student will need his/her own calculator! The calculator I use cost \$12 and serves me perfectly well. Come see me if you either don't know what calculator to get or find that this is a hardship for you. There is no need to get (or even use) a fancy graphing calculator. However, cell phone calculators are not good enough — you need a real calculator. You also will need web and email access, but of course that goes without saying.

The course web page:

The course web page is given at the very top of this syllabus. This is where I will post everything for this class: this includes this syllabus and the course outline; lecture notes; homework assignments and solutions; figures, images, and pictures I use during class; any supplemental materials; and other stuff. I will also put interesting newswatches here, both related to assignments (example: “I screwed up on the homework assignment and meant to write Earth instead of Moon”) as well as Astrobiology in the News (example: “NASA’s Mars Phoenix robotic spacecraft finds water on Mars”). I recommend that you check this web page several times a week. Just bookmark it and check to see if there is anything new that you should know about.

Office hours (how to find me and ask questions):

My office is Physical Sciences (Building 19) room 207 (phone number: 928 523 5505; email: David.Trilling@nau.edu). Please note that I do *not* respond to homework questions by email – it is too hard to communicate well this way.

My office hours are Tuesday 3:35–5 pm (right after class) and Wednesdays from 2–4 pm. I am also in my office most other days, so you can stop by if you would like to chat. You can also arrange a specific meeting time with me (which guarantees I will be there). If you have a regular conflict with my usual office hours, talk to me. It is certainly possible to set up another time for office hours if enough people have conflicts.

My only request is that you **do not come right before class**. I’m often still assembling materials and should probably use the time for class preparations rather than seeing individual students.

The other thing is that I strongly recommend – **strongly recommend** – that you start assignments early and not wait until the last day to come and ask me questions. Similarly, if you get lost in class, do not wait until you are really, really lost – take early action and avoid later problems.

Grading and assignments:

As you will quickly learn, astrobiology is a wild combination of many different kinds of science. I have adopted this philosophy in designing this class. You will therefore have many different kinds of assignments in this class.

All assignments are required. I do not accept any assignments by email. **All assignments are due in my hands in hardcopy (written or printed) at the beginning of class on the due date.** No electronic submissions will be accepted for any reason. No late submissions will be accepted.

You will have the following assignments (with their weight in the final grade given in parentheses): **midterm (20%); final exam (25%); term paper (20%); homework assignments (20% total); and quizzes (15% total).**

Your final grades will be calculated this way. I will simply total your points for the semester according to the above proportions; this gives a total out of 100 points. I will then compile everyone’s total grades and assign letter grades from the final, cumulative distribution, using as a guideline what I consider to be “A” work, “B” work, and so on. In this way, I let the performance of the class dictate the grade distribution. **Note:** I do not have a predetermined number or percent of A’s, B’s, etc. I also have no preset scale (like 90% correct is an A, 80% is a B, etc.). If everyone in the class does A work this semester, then you will all get A’s – no problem. I will give you status reports at many steps along the way so that you will

know where you stand. Also, you can ask me at any time how you are doing. I do not have any predetermined class average, mean, median, or letter grade. In previous semesters, my classes' average grades were around a B or a C.

A note about working together (statement on plagiarism and cheating):

Science works by sharing ideas. I encourage you to work together in this class. However, anything that has *only your name* on it should be written by you and you alone. This goes for homeworks, quizzes, and the final paper and of course the midterm and the final. Let me be clearer about the homework assignments: I encourage you to work together on these, by which I mean that you can discuss the best way to do the questions and compare answers. However, after working together, you should then write up your assignments by yourself. You should not have identical answers to anyone else in the class. If you do, you have cheated and perhaps plagiarized. This is absolutely not allowed in this class or this University, and I am very serious about this. Cheating pisses me off.

If you have any questions about what all this means – especially about working together on homeworks – please, please come talk to me. Don't wait until I get pissed off.

Here's the official statement: This course requires professional and ethical behavior. Plagiarism, or any form of cheating, violates this principle and will not be tolerated. The University regards acts of academic dishonesty as very serious offenses. Students charged with academic dishonesty are subject to the Arizona Board of Regents Code of Conduct and Procedures established by NAU.

Other stuff:

Required math skills: Math and manipulation of numbers and mathematical expressions will be required in this course. Every single one of you has all of the math skills (standard high school math) needed for this course. Don't be afraid, and don't be afraid to ask questions if you get stuck!

Term paper: I will give you more information about the final paper assignment in a month or so. The idea behind the paper is to give you a chance to do a different kind of thinking and allow you a different way to present your ideas. Think of it as an opportunity. If you are more inclined to be a reader and a writer, this will be your chance to shine.

Makeups: All assignments are required. There will be **no makeups**. If you have a **really** good reason for missing some graded assignment then come talk to me. You will not be punished, but each of your other assignments will increase in worth.

How to not be rude: Please turn off all your cell phones before you come to class. I don't want to hear them ring. Your fellow students don't want to hear them ring. Please don't text in class – that is disruptive to me and to the students around you.

Come talk to me: I want to hear if you are having fun in this class, or hating it; if you are learning stuff, or hopelessly confused, or just bored. I want to hear suggestions, and I want to learn your names and who you are. Hopefully you'll want to come to my office and learn about all the cool stuff we are working on and why I care about astrobiology. Don't be shy.

Swine flu: No one wants to be sick. Because of the real possibility of a swine (H1N1) flu epidemic on campus this year, we need to be extra careful and extra communicative. Basic stuff: Wash your hands a lot. Use the Purell dispensers in this building and across campus.

If you are sick or starting to feel sick, please don't come to class! You should email me and let me know that you are sick. We will then discuss what to do about missed assignments, if any. All lecture material will be posted on the web page, so making up that missed material will not be too difficult. I promise to be flexible and reasonable on this front. You need to be flexible and reasonable too: be safe, be honest, and, if possible, be healthy.

And now...: Let's begin!

Bonus material

How to succeed in this class

- Come to class.
- Sit toward the front.
- Ask questions.
- See that I learn your name. This is not because I boost grades for students I know, but because I tend to learn students' names when they talk to me, which is also when they tend to get their questions answered.
- Come to office hours.
- Ask lots of questions.
- Start assignments early (and ask questions).
- Do the reading – it'll help you understand the lecture material. The reading assignments are short!
- Ask questions and make comments in class.
- Ask lots of questions.

How not to succeed in this class

- Don't come to class.
- Come to class, but sit in the back and read the newspaper.
- Wait until the last minute to start assignments.
- Wait until you are very lost before coming to ask questions.
- Assume that you can “catch up” if you fall behind – this course is *not* repetitive, and each topic is an important building block.
- Fail to read instructions and budget time appropriately.